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Q-6 12/13/84

EVALUATION OF THE PASCO SANITARY  
LANDFILL WASTE DISPOSAL PRACTICES

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AND

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**LETTER OF TRANSMITTAL**

TO

Chris NadlerEcology and Environment108 S. Washington Street, Suite 302Seattle, Washington 98104DATE 12/13/84

PROJECT NO. \_\_\_\_\_

PROJECT NAME \_\_\_\_\_

ATTENTION: Chris NadlerRE: Evaluation of the PascoSanitary Landfill WasteDisposal Practices~~REMIKEMEN~~ Chris:WE ARE SENDING YOU ☐ ATTACHED ☐ UNDER SEPARATE COVER VIA \_\_\_\_\_ THE FOLLOWING ITEMS:☐ SHOP DRAWINGS ☐ PRINTS ☐ PLANS ☐ SAMPLES ☐ SPECIFICATIONS☐ COPY OF LETTER ☐ CATALOG SHEETS ☐ CHANGE ORDER ☐ \_\_\_\_\_

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1		Enclosed please find one copy of the Evaluation of the Pasco
		Sanitary Landfill Waste Disposal Practices being sent to you
		at the request of John Zillich.

**THESE ARE TRANSMITTED AS CHECKED BELOW:**☐ FOR APPROVAL☐ AS REQUESTED☐ RETURNED FOR CORRECTIONS☐ FOR YOUR USE☐ FOR REVIEW AND COMMENT☐ FOR BIDS DUE \_\_\_\_\_, 19\_\_\_\_ ☐ PRINTS RETURNED AFTER LOAN TO US**REMARKS:**

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EVALUATION OF THE PASCO SANITARY  
LANDFILL WASTE DISPOSAL PRACTICES

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## INTRODUCTION

This report was prepared in response to a February 20, 1981 letter from Mr. Lawrence L. Peterson, Washington State Department of Ecology to Mr. Larry Dietrich, Pasco Sanitary Landfill, Inc. (see Appendix 1). On March 26, 1981, J-U-B ENGINEERS, Inc. was selected to perform the engineering and environmental analyses required to respond to this letter. The format of the report will be to restate the Department of Ecology (D.O.E.) concerns or requests for information and then address each of the issues with the information gathered since March 26. The Pasco Sanitary Landfill is located at the outskirts of the City of Pasco, Washington in the southeast corner of the State (figure 1). The landfill currently accepts domestic solid wastes from the cities of Kennewick and Pasco. It also accepts septic tank chemical toilet and holding tank wastes and has in the past disposed of some industrial wastes. The major concerns of the D.O.E. are related to the disposal of approximately 11,000 gallons per day of septic tank pumpings, chemical toilet pumpings and holding tank pumpings at two lagoons located at the site. The D.O.E. is concerned about potential contamination of the groundwater from the wastes in these lagoons and also the potential to mobilize industrial waste buried at 5 other locations within the site boundary. The D.O.E. is also concerned over the potential of unwarranted disposal of hazardous waste at the Pasco Landfill because of the lack of hazardous waste disposal site in the State of Washington. The D.O.E. has asked a number of questions related to these concerns and requested an engineering report on the adequacy of the lagoon treatment. In addition, they have requested that a groundwater monitoring program be developed at the site to document the lack or actual impact of site disposal activities upon the groundwater.

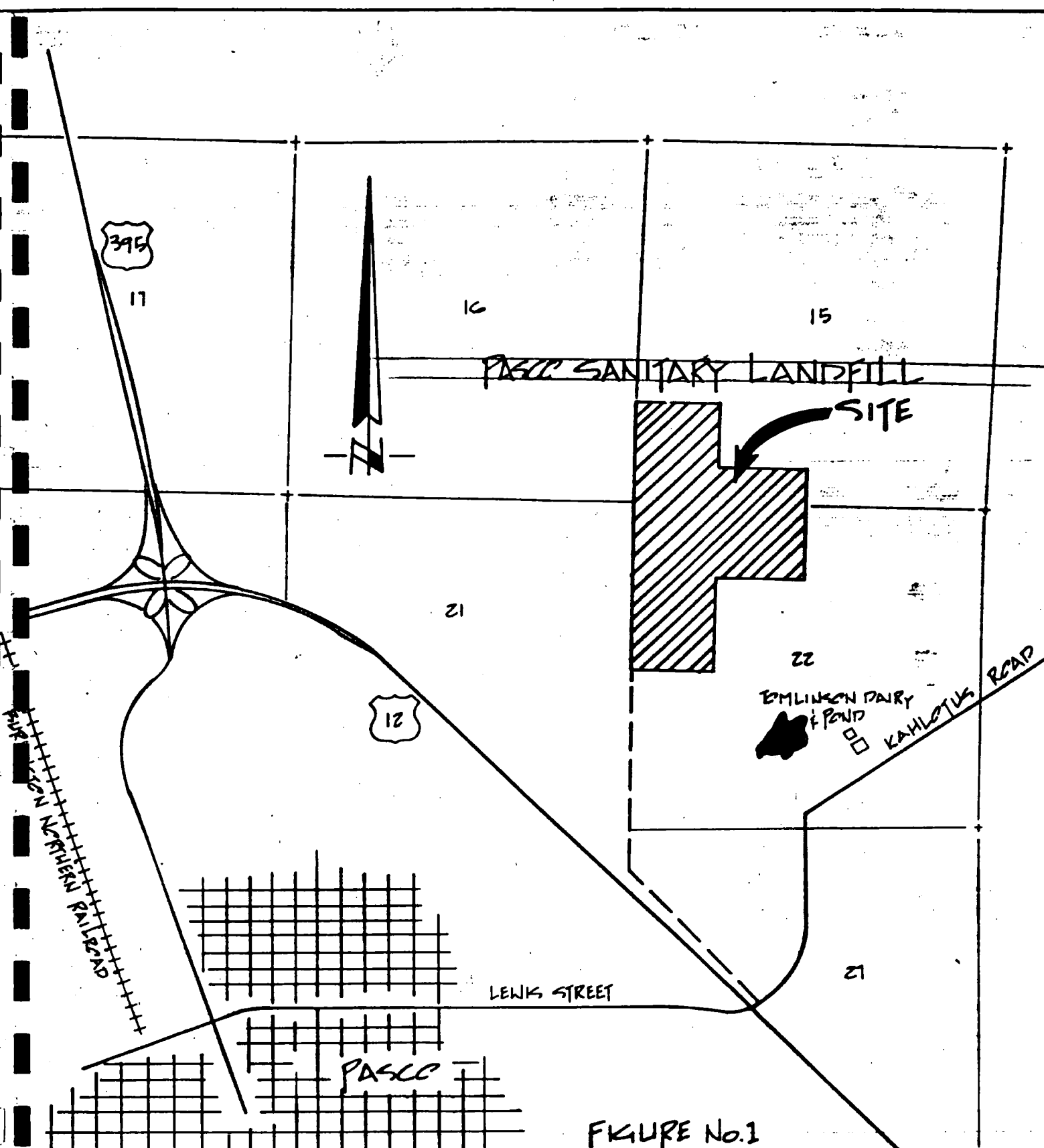


FIGURE No.1  
**PASCO SANITARY LANDFILL  
 VICINITY MAP**



<b>JUB ENGINEERS, INC.</b>			
Engineers		Planners	
KENNEWICK		WASHINGTON	
DE	DR.	CK.	
DATE JUNE, 1961			DWG NO

SCALE 1" = 2000'

"We are concerned that the treatment/disposal facility is deficient in the following areas:

1. It is constructed to allow percolating waste to reach groundwater.

Some waste will undoubtedly reach the groundwater beneath these sewage lagoons. We hope the intent of this statement is not aimed at "zero discharge". We believe State and Federal Regulations covering the percolation rate from sewage lagoons and the quality of groundwater allow for some discharge yet provide adequate protection of the environment. Specifically, the State of Washington Department of Ecology Criteria for Sewage Work Design, Section 15.413 states (for sewage lagoons) "The thickness and the permeability of soil liners shall be sufficient to limit the leakage to the maximum allowable rate 1/4 inch per day." As discussed later under Item 3, the rate of infiltration may need to be reduced at the new overflow lagoon to meet this criteria. The well log from the Pasco Landfill Well indicates there is a high degree of sand and silt at the site to the depth 80 feet. This should provide a great deal of filtering and absorbtion of waste materials and fecal coliforms.

The Environmental Protection Agency regulations on Criteria for Classification of Solid Waste Disposal Facilities 40 C.F.R. 257.34 Groundwater states "(a) A facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary ....."

In this case, "contaminate" means the groundwater at the solid waste site boundary should not exceed 10 milligrams per liter nitrate (as N) nor should it exceed 4 coliform bacteria per 100 milliliters if one sample is taken. As indicated in the Groundwater Monitoring Section, a new well or possibly wells need to be drilled to determine compliance with this requirement. Applying drinking water quality standards at the site boundary seems very restrictive in comparison to surface discharge which are rarely required to meet drinking water standards at a site boundary. Should the drinking water be shown to be in compliance with drinking water criteria at the plant boundary, this should provide sufficient evidence that continued disposal operations are not having an adverse impact on the environment and should be allowed to continue.

"We are concerned that the treatment/disposal facility is deficient in the following areas:"

2. "There is a potential for saturation of adjacent soil containing previously deposited industrial materials."

Saturation could occur from seepage percolating laterally from the lagoons to the industrial sites. The degree of saturation was determined in the vicinity of all of the industrial waste sites and a control site away from the waste disposal facility. The exact depth of the buried industrial waste was estimated by the landfill operator and samples were taken at 1, 3, 5, 10, 15 and 20 foot intervals dependent upon the depth of the buried industrial waste and observations in the field at the time of sampling. Table 1 shows the degree of saturation at each of the sites analyzed.

Two of the data point in the table need explanation. The first is the saturated condition at the 5 foot level at site 4-C west. This condition was created by surface irrigation applied in an attempt to establish a cover crop to reduce wind erosion. Test results in Table 1 indicate the water percolated down to the ash layer. Note that the moisture content of the "control" or non-irrigated natural site north of the landfill were considerably less than those at C. west. The ash layer is thought to be a result of old burying at this exact location. The ash served as an impermeable

barrier to the moisture applied above. The degree of saturation was considerably less than 100% at deeper depths. Subsequent borings around this particular hole indicated this ash pocket was very localized, was not indicative of a general condition at the site and the other soils samples were noticeably dryer. While the data indicates the saturated condition was not the result of the lagoon disposal, it does point out a need to keep surface irrigation to a minimum.

The other point of concern is sample 5-A Northeast which shows a 74.5% degree of saturation (Table 1). This area was not influenced by the surface irrigation, but has been influenced by water added to site to put out fires in 1978 and 1979. Additional samples were not taken closer to the northeast corner of Site A because the area has been backfilled with baled garbage, stumps, large pieces of concrete, and other materials that could not be penetrated with the sampling equipment.

Figure 2 shows the relative locations of the lagoons, industrial waste disposal sites, and the sampling locations. The degree of saturation is indicated for the deepest depth at each location. The figure illustrates that the sites are not being saturated from lateral percolation of lagoon wastewaters.

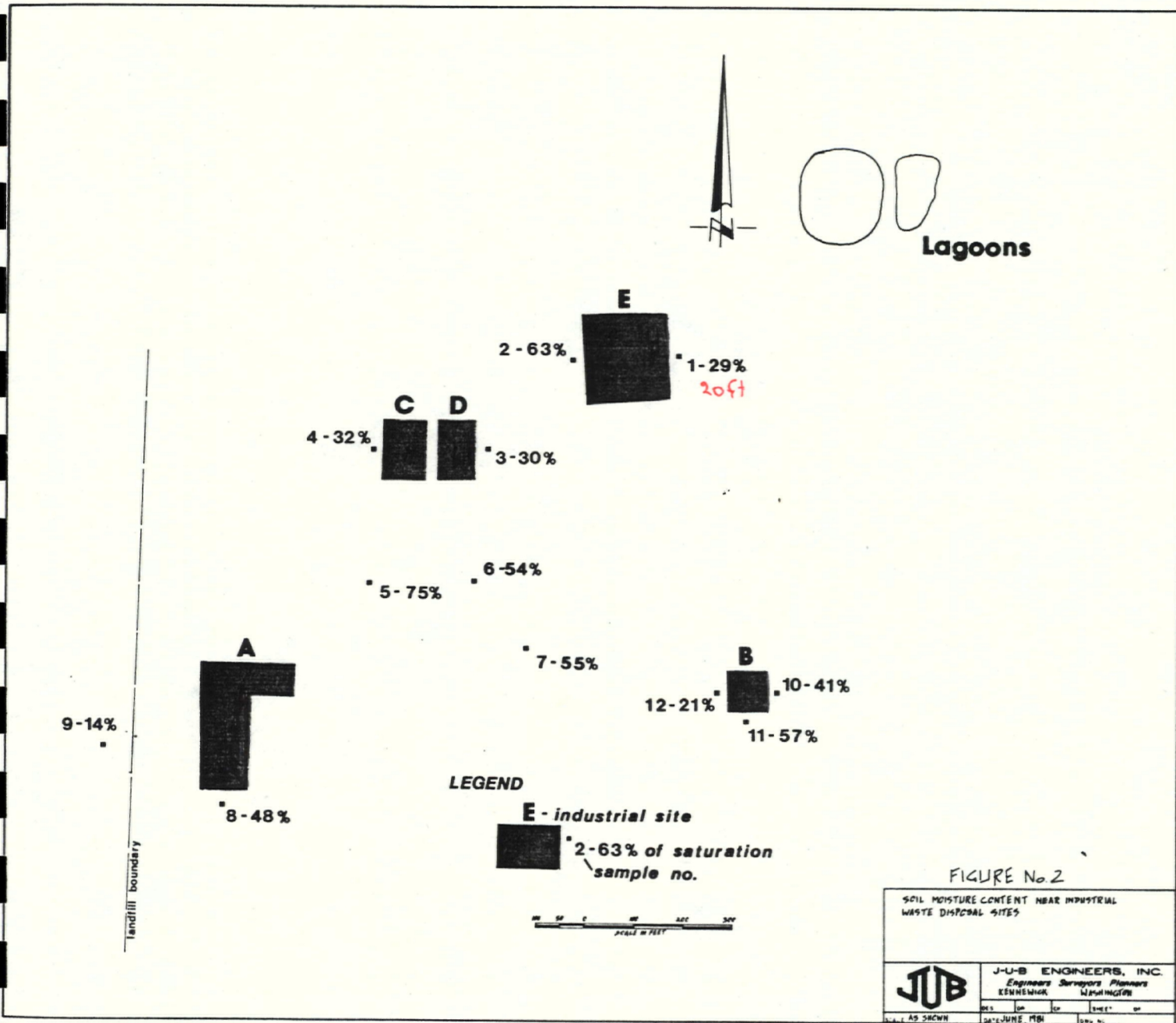


TABLE 1  
SOIL INVESTIGATION AND  
SUMMARY OF LABORATORY RESULTS IN THE  
VICINITY OF THE INDUSTRIAL WASTE DISPOSAL  
SITES AT THE PASCO LANDFILL

SAMPLE	LOCATION	DEPTH IN FEET	SOIL CLASSIFICATION	DRY WEIGHT MOISTURE CONTENT, %	DEGREE OF SATURATION, %
C	Control	1	SAND, Silty	4.0	15
C	Control	3	SAND, Silty	3.6	13.5
C	Control	5	SAND, Silty	8.0	30.0
C	Control	10	SAND, Silty	6.6	24.7
C	Control	15	SAND, Silty	7.9	29.6
C	Control	20	SAND, Silty	4.9	18.4
1	E. East	20	SAND, Silty	7.7	28.8
2	E. West	1	SAND, Silty	11.2	42.0
2	E. West	3	SAND, Silty	7.4	27.8
2	E. West	5	SAND, Silty	3.2	12.0
2	E. West	15	SAND, Silty	7.5	28.1
2	E. West	20	SAND, Silty	16.9	63.4
3	D. East	1	SAND, Silty	17.5	65.6
3	D. East	5	SAND, Silty	11.5	43.1
3	D. East	15	SAND, Silty	8.7	32.6
3	D. East	20	SAND, Silty	8.0	30.0
4	C. West	1	SAND, Silty	9.9	37.1
4	C. West	3	SAND, Silty	12.0	45.0
4	C. West	5	SILTY, Sandy (ash)	37.3	113.0
4	C. West	15	SAND, Silty	5.7	21.4
4	C. West	20	SAND, Silty	8.5	31.9
5	A North East	10	SILT, Sandy	24.6	74.5
6	A North East	5	SAND	7.9	29.6
6	A North East	10	SAND, Silty	10.2	38.2
6	A North East	15	SAND, Silty	14.4	54.0
7	A North East	5	SAND Poorly graded	6.0	23.0
7	A North East	10	SAND, Silty	14.6	54.8
8	A South	20	SILT, Sandy	15.8	47.9
9	W. of Road	15	SAND, Poorly Graded	3.7	13.9
10	B. East	10	SAND, Silty	10.8	40.5
11	B. South	10	SILT, Sandy	18.8	57.0
12	B. West	10	SAND, Silty	5.6	21.0

3. The Constituents of Wastes Entering the Site are Not Documented.

Since receiving your letter, operations personnel at the landfill have been keeping individual records on each shipment of waste delivered to the lagoons. Records include separate entries for the type of waste, the origin of the waste, the quantity delivered, and the hauler making the delivery.

An evaluation of all the deliveries made from April 1, 1981 through May 31, 1981 is summarized in Table 2. Ninety-Two percent (92%) of the liquid wastes disposed of at the lagoons originated at Hanford Construction Projects.

Wastes continue to be documented by operating personnel.

TABLE 2  
WASTE VOLUMES DELIVERED TO  
THE PASCO LANDFILL LAGOONS 4/1/81 TO 5/31/81

	TOTAL FOR APRIL & MAY (gals.)	DAILY AVERAGE (gals.)	% OF TOTAL
• Hanford Wastes *	611,020	10,017	92
• Chemical Toilets	8,800	144	1
• Septic Tanks	48,750	799	7
• Non-Hanford Holding Tanks	2,400	40	less than 1
	695,870	11,000	100

\* includes a combination of chemical toilets,  
holding tanks and septic tank pumpings.

4. The honor system of control is inadequate to prevent unauthorized dumping.

This item is discussed later under Item 2, "An analysis of lagoon and selected incoming waste for the presence of pollutants."

We require you submit to this department the following information prior to July 1, 1981.

1. A hydrogeologic report covering at a minimum the following:
  - a. Groundwater characteristics including flow direction, quantity, quality, elevation, and an evaluation of the impact associated with any future irrigation expansion.

#### GROUNDWATER FLOW DIRECTION

Flow direction was determined by surveying adjacent wells to accurately establish the exact location and elevation of each well. Groundwater elevations were measured April 24 and April 25. Figure 3 shows groundwater elevations at each well and the contours developed from the measured elevations.

Contours and flow directional lines upgradient to the Pasco Landfill well appear very straight. While uni-directional flow may in fact depict the flow, the reader should bear in mind there are essentially only two reliable transects across the water table for drawing these contours and the contours reflect 5 foot changes in elevations.

Contours downgradient show a more complex flow pattern. Note that the contours downgradient of the Pasco Landfill illustrate every 0.5 foot change in elevation. If a 5 foot contour were chosen,

there would be no lines downgradient of the site. The significance of all this is that the slope upgradient of the Pasco Landfill is fairly steep. The elevation of the water table drops 16' in the 4300 feet between Well No. 1 and the Pasco Landfill Well. The slope downgradient of the Landfill becomes very flat, dropping only 4.9' in the 4900 feet between the Pasco Landfill well and well No. 5. The shaded area on Figure 3 indicates contours of questionable integrity. All contours in the shaded area are influenced by the water elevation at Well No. 2. The well is probably strongly influenced by a water mound built up as a result of the Tomlinson Dairy pond. The elevated ridge in the groundwater elevations between Well No. 2 and the Pasco Landfill well is in all likelihood an artifact of this water mound. Because of this, a flow directional line was not shown between wells 2 and 3. An additional well or wells need to be drilled to accurately establish the directional flow of groundwater at the southern boundary of the Pasco Landfill Site.

WELL #7  
GW ELEV. 350.40

WELL #8  
GW ELEV. 356.90

WELL #1  
GW ELEV. 367.50

WELL #6  
GW ELEV. 347.10

WELL #9  
GW ELEV. 351.50

WELL #2  
GW ELEV. 348.00

WELL #3  
GW ELEV. 348.00

WELL #5  
GW ELEV. 346.60

WELL #4  
GW ELEV. 346.80

WASTEWATER  
LAGGONS

INDUSTRIAL WASTE  
DISPOSAL SITES

LOMLINSON  
DAIRY POND

CONTOURS INFLUENCED  
BY WATER MOUND

FIGURE No.3

GROUNDWATER ELEVATIONS AND  
DIRECTIONAL FLOW IN THE VICINITY OF  
THE PASCO SANITARY LANDFILL

SCALE IN FEET  
0 500 1000

JUB

J-U-B ENGINEERS, INC.  
Engineers Planners  
KENNEWICK WASHINGTON

DES. DR. CK. SHEET OF  
DATE JUNE, 1981 DWS NO.

## QUANTITY AND VELOCITY

Well drawdown tests and standard hydrologic calculations were used to determine transmissivity values for the aquifer at wells 5, 6 and 7. <sup>(1)</sup> The drawdown data was taken from original drillers logs. While the data is traditionally used to determine well potential, it can be used to approximate transmissivity values. Transmissivity in this case is defined as the rate at which water will flow through a vertical strip of the aquifer one foot wide and extending through the full saturated thickness under a hydraulic gradient of 1.00 or 100%. The transmissivity of the aquifer at wells 5, 6 and 7 are shown in Table 3. Permeability, the discharge that occurs through a unit crosssection 1 foot square was also calculated to determine an estimated velocity of groundwater flow. The average permeability of the wells was 1042 feet<sup>3</sup>/feet/day. The velocity was 1 foot/day and will be an important consideration in later discussion. These calculations are included as appendix 2.

It should be recognized that estimated transmissivity, permeability and velocity values are based upon pumping data from a gravel strata (wells are screened at the most productive depths) and may not represent those values for the sandy strata where the top of the aquifer exists. However, the transmissivity, permeability and velocity should be even less in the sand and provide an additional margin of safety when discussing potential wastewater movement.

TABLE 3  
TRANSMISSIVITY AND  
PERMEABILITY OF THE AQUIFER NEAR  
THE PASCO SANITARY LANDFILL

<u>WELL NO.</u>	<u>TRANSMISSIVITY (ft.<sup>3</sup>/ft./day)</u>	<u>PERMEABILITY (ft.<sup>3</sup>/ft.<sup>2</sup>/day)</u>
5	58,600	935
6	27,000	482
7	82,000	1,708

## QUALITY

With the exception of the sample of the Pasco Landfill well done in October of 1980, no other records of groundwater quality in the immediate area could be obtained. Table 4 indicates that of the parameters analyzed all were below drinking water standards.

The quality of groundwater downgradient of the Pasco Sanitary Landfill site is of primary importance. Since groundwater sampling and analysis is an expensive proposition, utmost must be taken to select the samples and analyses that are of most significance. Given the direction of flow and rate of flow described above, and the fact that the sewage lagoons would be the only source providing a movement of wastewater to the groundwater table, it is important to estimate the location of this wastewater before samples are taken. The sewage lagoons have been in operation for approximately 6 years. Even if one assumed a worse case condition that the percolate from these lagoons were to reach the groundwater immediately after the lagoons were put into use, the total number of days available to groundwater travel would be 2,190 days. This, coupled with the calculated groundwater movement of 1 foot per day would mean the waste would have traveled roughly 2,190 feet to date. By referring back to figure 3, the only well that could have been impacted by this time would be the Pasco Sanitary Landfill well. All other offsite wells are more than 2,190 feet downgradient. Groundwater quality will be determined at Landfill wells as part of the groundwater monitoring program discussed later in this report.

TABLE 4  
COMPARISON OF PASCO LANDFILL  
WELLWATER CONTENTS (OCTOBER 1980)  
TO FEDERAL DRINKING WATER STANDARDS

<u>Parameter</u>	<u>Contents of Pasco Landfill Well Water (mg/l)</u>	<u>Drinking Water Standards (mg/l)</u>
Total Dissolved Solids	400	500
Total Alkalinity as $\text{CaCO}_3$	173	*
Total Hardness as $\text{CaCO}_3$	240	*
Calcium	59	
Magnesium	23	*
Sodium	32	*
Potassium	4	*
Sulfate	81	250
Chloride	28	250
Nitrate as "N"	3.56	10
pH, Standard Units	7.3	6.5-8.5
Specific Conductance (umhos/cm)	577	*

\* No Drinking Water Standard has been established.

## IRRIGATION EXPANSION

The impact of additional irrigation expansion near the Pasco Landfill would come from additional development of the Potholes Canal System or from additional pumping from the aquifer. Canal development could theoretically raise the water table, but the evidence indicates this is not happening now and is not expected to happen in the future. Additional pumping from the aquifer would lower the existing water table. This is in fact what is happening.

Additional development from the Potholes Canal System is highly unlikely because the overwhelming majority of the land is already irrigated by wells pumping from the groundwater. Within one mile of the Pasco Landfill boundaries, there are 18 circles pumping from groundwater. The South Columbia Basin Irrigation District has no current request for additional surface water from landowners in the Pasco greenbelt, the area surrounding the Pasco Landfill. The secretary-manager, Russell Smith of the South Columbia Basin Irrigation District feels that if additional development requests occur, they will be as a result of a continual lowering of the groundwater table in the area due to additional withdrawal. (3) This is not in the foreseeable future.

547-1735  
545-2070

Within a 4-mile radius of the Pasco Landfill, there are 15 Water and Power Resources Service monitoring wells. Figure 4 shows the location of four of these wells near the site. Elevation of the water table during high water years of '74 and '75 and the current ('81) water levels. Well No. 9/3017C is one of the older wells and has shown an increasingly elevated water table up to 1974 and 1975. In 1956, the water in this well was 87 below grade. The elevation of the water table increased steadily until it averaged about 77' and 78' below grade in 1974 and 1975. In March of 1981, the water table was 81' below grade, a drop of 3-4 feet.



Groundwater at the three closest monitoring wells to the Pasco Landfill has shown similar drops in elevation. Groundwater at well number 9/30 16F-1 northwest of the landfill has gone from an annual average high elevation during 1974 and 1975 of 48' below grade down to 52' below grade in March of 1981. Groundwater at well number 9/30 14 MI. northeast of the landfill has gone from 101' below grade to 109' below grade in March of 1981. Likewise, well No. 23 NE has gone from a high in 1974 and 1975 of 79' below grade to being 85' below grade in March of 1981.

The Water and Power Resource Service has modeled expected changes in groundwater elevations due to irrigation through 1998.<sup>(4)</sup> They predict groundwater elevations will continue to fall in all areas within a 7 mile radius of the confluence of the Snake and Columbia Rivers. This takes in the groundwater beneath the Pasco Landfill and all sections at least 4 1/2 miles north and west of the site.

In summary, it appears the elevation of groundwater in the vicinity of Pasco Landfill will continue to fall and consequently will not present a mobilizing threat to the solid or industrial waste disposal at the site.

We require you submit to this department the following information  
prior to July 1, 1981:

1. A hydrogeologic report covering at a minimum the following:

- B. A description of soil mechanics relating to transport of chemical and biological contaminants and analyses of the potential for lateral movement of percolating wastewater.

As we discussed in a May 20 meeting, between Messrs: Zillich (J-U-B), Dietrich (Pasco Landfill) and Peterson (D.O.E.), such a description of soil mechanics or potential for lateral movement of percolating wastewater would be largely theoretical and the degree of soil saturation in the vicinity of the industrial waste sites would be a more direct means of addressing these concerns. As noted in Item 2, above, these measurements have been made and saturated conditions do not exist at the industrial waste disposal sites.

We require you submit to this department the following information prior to July 1, 1981:

1. A hydrogeologic report covering at a minimum the following:

C. An Outline of a Groundwater Monitoring Program That Will Determine the Existing and Future Groundwater Quality Impact of Percolate from the Treatment/Disposal Facility.

The main factors to consider in selecting a groundwater monitoring program for this site are:

- 1) Location of Monitoring Wells
- 2) Number of Monitoring Wells
- 3) Frequency of Analyses
- 4) Types of Analyses

The logic used to select these factors was basically to use good environmental sampling practices and evaluate those practices against regulations affecting disposal activities at the site.

The location of the wells need to be selected such that an upgradient control station is established to determine quality of the groundwater unaffected by the Pasco Sanitary Landfill. Downgradient wells need to be selected to determine the impact of the disposal operation upon the groundwater and to determine compliance with regulatory standards. As seen from Figure 3, well No. 1 will serve as an excellent monitoring well to determine upgradient groundwater conditions.

As described in the Groundwater Characteristic Section (1a) of this report, the downgradient flow is more complex than the upgradient flow and there is the need to determine more accurately the directional flow

of groundwater at the south boundary of the disposal site. We propose to drill a new monitoring well at the site for determining groundwater elevation and subsequently the directional flow at this point. We believe this well will be in the direct path of the plume generated from the sewage lagoon and will serve as the downstream monitoring point for compliance purposes. Should this well not be in the direct line of the sewage lagoon percolate plume, an additional well will have to be drilled. Because of the E.P.A. criteria in 40 C.F.R. 257, we believe the well (s) should be drilled at the plant boundary for determining regulatory compliance. The existing Pasco Landfill well can be used to determine compliance for solid waste operations north and west of the industrial and sewage lagoon disposal site.

If compliance is shown at all site boundary wells, the frequency of analyses would be once per year.

The regulatory documents providing the most quantitative guidance for groundwater analyses relative to disposal practices at this site appears to be in the Environmental Protection Agency Regulations on Criteria for Classification of Solid Waste Disposal Facilities and Practices, 40 C.F.R. 257. While this document does not have directly enforceable criteria, these criteria must be met by state programs if they are to be approved by E.P.A.\* Part 257.3-4 requires that "a solid waste facility or practice shall not contaminate an underground drinking water source at the solid waste boundary."

\* The Washington State Solid Waste Management Plan has not been approved by E.P.A.

"Contaminate" means the groundwater shall not contain more than the allowable quantities of contaminants as allowed by 40 CFR 141 Environmental Protection Agency National Interim Primary Drinking Water Regulations. To determine compliance analyses would have to be performed for each of the parameters in the top half of Table 4.

The format of the E.P.A. regulations is to write minimum acceptable quantitative standards with the intent of having state and local regulations at least as restrictive as the federal standards. Washington's regulations have been qualitatively written. That is, they address water quality in a qualitative sense only. This allows the state flexibility to select quantitative restrictions on a case by case basis using the permit process as described in RCW 90.48.

The document that sets forth state policy is R.C.W. 90.48, Water Pollution Control. However, this policy document does not provide specific water quality standards or specific parameters to be monitored in groundwater situations. The Washington State Solid Waste Management Plan submitted in December of 1980 and currently being reviewed by the Environmental Protection Agency does not have any specifics relative to groundwater monitoring parameters. Chapter 173-301 of the Washington Administrative Code, the Washington State Department of Ecology Regulation Relating to Minimum Functional Standards for Solid Waste Handling, likewise lacks quantitative specifics.

The parameters in the lower half of Table 5 are those parameters which need to be analyzed based upon a knowledge of the material disposed of at the Sanitary Landfill and the Environmental Protection Agency National Secondary Drinking Water Regulations 40 C.F.R. 143.

The frequency of all analyses would be once per year.

TABLE 5  
PROPOSED ANALYSES TO BE CONDUCTED  
ON GROUNDWATER SAMPLES  
IN THE VICINITY OF THE PASCO SANITARY LANDFILL

PARAMETERS REQUIRED BY E.P.A. CRITERIA 40CFR141 + 40CFR257	MAXIMUM CONTAMINANT LEVELS
	mg/l
Arsenic	.05
Barcium	1.0
Cadium	.01
Chromium	.05
Lead	.05
Mercury	.002
Nitrate (asN)	10.00
Selenium	.01
Silver	.05
Fluoride	2.0
Endrin	.0002
Lindane	.004
Methoxychlor	.1
Toxaphene	.005
2, 4, - D	.1
2, 4, 5 - Tp	.01
Turbidity	1 TU
Coliforms	3

SUGGESTED PARAMETERS  
40CFR143 AND SITE CHARACTERISTICS

	mg/l
Chloride	250
Color	15
Iron	.3
Manganese	.05
pH	6.5 - 8.5
Sulphate	250
Total Dissolved Solids	500
Phenol	None
Total Organic Halogens	None
Total Nitrogen as N	None
Odor	3
Borate	None

We require you submit to this department the following information prior to July 1, 1981:

2. An analyses of lagoon and selected incoming wastes for the presence of pollutants. (The list of pollutants and number of analysis required will be provided after an examination of hauler records.)

It is assumed that the intent of the request is to analyze the lagoon and incoming waste to determine relative hazardous potential. There is a multitude of items that could be hazardous. 40 C.F.R. 261 Part III E.P.A. Identification and Listing of Hazardous Wastes reduces the quantity to be considered substantially for regulatory purposes only. Subpart D lists 16 generic industrial wastes from non-specific sources, 69 generic wastes from specific sources and 461 discarded commercial products or compounds. The logic for our approach to this analytical problem was to limit the choices to those items that would be hazardous on the basis of their toxicity if they were to get to the groundwater. The liquid phase of the lagoon was sampled to represent the present lagoon contents. A composite sample was taken by combining samples from several locations across the surface of the lagoon. The sludge phase was sampled to represent the accumulative waste inventory in the lagoon. Composites were taken at six different locations from the sludge layer on the bottom of the lagoon. Our analytical approach will be to follow the E.P. toxicity tests described in 40 C.F.R. 261. Both phases will be analyzed using the E.P. toxicity test procedures largely because these analytical procedures are established procedures that have received some scrutiny. This analytical exercise is very expensive and it would make no sense to look for relatively exotic constituents in these types of waste matrices if the reliability or sensitivity of the techniques were unknown. The samples are currently being analyzed for Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, and Silver. The samples are also being analyzed for total organic halogens. The total organic halogen test is

a more comprehensive test than the six organics required by E.P.A. If the total organic halogen result exceeds E.P. toxicity limits for any of the individual specific organic halogens listed by E.P.A., these samples may have to be analyzed for their individual constituents. In addition, the samples are being analyzed for nitrate and total nitrogen to determine the potential nitrate concentration once the organic and ammonia nitrogen are all converted to nitrate. Because of the extended laboratory time required to do these analyses, the results are not available at this time. The results will be forwarded to you as soon as possible, but no later than July 31, 1981.

We require you submit to this department the following information prior to July 1, 1981.

3. An Engineering Report that describes the existing facility, assesses its treatment/disposal capabilities and addresses any needs for modification.

The location of the existing lagoons are shown on Figure 2. The primary lagoon is the most westerly lagoon. It measures 150-170 feet and has a maximum depth of 10 feet. The water level in the primary lagoon is established by an overflow pipe which drains to the overflow lagoon. The lagoons are used for the treatment/disposal of sewage wastes of which more than 90% currently originates from construction projects at the Hanford Site.

The need to modify or expand the lagoons is dependent upon projected waste loads and the efficiency of the treatment provided. There will be a substantial reduction in the amount of wastes received from the Hanford site after July 1, 1981.<sup>(5)</sup> After this date, lagoons at Hanford will start treating this waste. The amount of sewage delivered to the Pasco Lagoons from Hanford will be reduced from the current 10,000 gallons per day to 2,000 gallons per day.

The efficiency of the treatment provided can be judged by (1) comparing pond performances to accepted design criteria and (2) evaluating not only the pond but the soil columns efficiency for removing pollutants. First the Washington Department of Ecology Criteria for Sewage Works Design requires sewage lagoons to have a percolation rate of less than 1/4 inch (.25") per day. Percolation rates were measured on these ponds. Table 6 shows the primary lagoon to be well within these criteria, but the overflow lagoon was in all probability in excess of this figure. The percolation rate of the overflow lagoon was .25" per day on the second day of the study after the water level had fallen below the most permeable upper layer of the lagoon and surely was excess of this on the first day when the rate of this lagoon was not measured.

The overall changes in water level of the primary lagoon were calculated assuming incoming load would be 3,000 gallons/day (2,000 gallons Hanford + 1,000 gallons other) after July 1. To introduce a factor of safety, the percolation rate was assumed to drop to .03 inches per day. Using precipitation and evaporation data applicable to the site, it was determined there would be an initial loss of water elevation in the primary lagoon, thus eliminating the overflow and the violation of design criteria. However, by mid-November this trend reverses and the overflow lagoon would again be needed, See Table 7.

However, site characteristics should be considered in this situation. There is 70 feet of sandy soil between the lagoon and the water table, the distance to the site boundary is more than 2,000 feet and the estimated travel time is 5 3/4 years. These lagoons have been in operation long enough so that the actual impact can and should be measured before the decision to modify or expand the lagoons is made. We believe the placement of a well in the south east corner of the landfill site will intersect the wastewater plume and provide direct evidence on the adequacy of treatment.

TABLE 6  
PERCOLATION RATES  
FOR PASCO LANDFILL LAGOONS

DATE	<u>PERCOLATION RATES (Inches/Day)</u>	
	Primary Lagoon	Overflow Lagoon
5/6/81 - 5/7/81	.08	--
5/7/81 - 5/8/81	.07	.25
5/8/81 - 5/11/81	.05	.13

TABLE 7  
PROJECTED MONTHLY  
CHANGES IN PRIMARY LAGOON WATER  
ELEVATIONS JULY - DECEMBER 1981

	Monthly Net Natural Change Evap/Precip. *(In.)	Monthly Net Change Swg. Addn./Percolation (In.)	Monthly Net Change In Lagoon	Cumulative Change (In.)
J	-6.12	4.80	-1.32	-1.32
J	-7.71	4.96	-2.75	-4.07
A	-6.38	4.96	-1.42	-5.49
S	-3.83	4.80	+ .97	-4.52
O	-1.72	4.96	+3.24	-1.28
N	- .09	4.80	+4.71	+3.43
D	+ .86	4.96	+4.10	+7.53
			Mid Nov. overflow occurs again	

\* U. S. Weather Bureau information covering 17  
years of record.

### SUMMARY

1. The adequacy of the existing sewage lagoon system can and should be determined on the basis groundwater quality at the site.
2. The industrial waste disposal sites are not being saturated by lateral movement of wastewaters from the sewage lagoons.
3. Constituents of wastes entering the sewage lagoons are being recorded and approximately 90% of the volume comes from Hanford Construction projects.
4. The lagoon water and sludges have been sampled and are being analyzed for toxic materials; results should be available by July 1, 1981.
5. Groundwater flow direction and quantity have been determined near the landfill site but an additional well needs to be drilled to verify flow at the Landfills southern boundary.
6. Future irrigation expansion will reduce groundwater elevations and consequently have no impact upon the waste disposal practices.
7. A groundwater monitoring program has been established to determine current and future impacts of site operations.

## REFERENCES

- 1 Groundwater Manual U.S. Department of Interior 1st Edition
- 2 Groundwater and Wells. Johnson Division Universal Oil Products Company St. Paul, Minnesota 1972
- 3 Personal Communication - Russell Smith, Secretary-Manager South Columbia Basin Irrigation District
- 4 Personal Communication - H.D. Newman, Geologist Water Power & Resource Service, Sept. of the Interior U.S. Government
- 5 Personal Communication - T. Rutz, Environmental Engineer Washington Public Power Supply System

APPENDIX 1

CORRESPONDENCE FROM D.O.E.



Governor

February 18, 1981

Pasco Sanitary Landfill, Inc.  
1218 North 4th  
Pasco, WA 99301

Attention: Mr. Larry Dietrich

Dear Mr. Dietrich:

We have received your State Waste Permit Discharge Application and have concluded that we have insufficient information to issue the permit.

We are concerned that the treatment/disposal facility is deficient in the following areas:

1. It is constructed to allow percolating wastes to reach ground water.
2. There is a potential for saturation of adjacent soil containing previously deposited industrial wastes.
3. The constituents of wastes entering the site are not documented.
4. The honor system of control is inadequate to prevent unauthorized dumping.

We require you submit to this department the following information prior to July 1, 1981:

1. A hydrogeologic report covering at a minimum the following:
  - a. Ground water characteristics including flow direction, quantity, quality, elevation, and an evaluation of the impact associated with any future irrigation expansion.
  - b. A description of soil mechanics relating to transport of chemical and biological contaminants and an analysis of the potential for lateral movement of percolating waste water.
  - c. An outline of a ground water monitoring program that will determine the existing and future ground water quality impacts of percolate from the treatment/disposal facility.
2. An analysis of lagoon and selected incoming wastes for the presence of pollutants. (The list of pollutants and number of analysis required will be provided after an examination of hauler records.)

February 18, 1981

-2-

Pasco Sanitary Landfill, Inc.  
Attention: Mr. Larry Dietrich

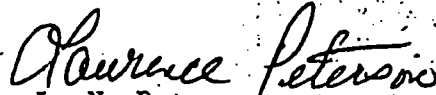
3. An Engineering Report that describes the existing facility, assesses its treatment/disposal capabilities and addresses any needs for modification and/or expansion.

As an interim measure, you are required to immediately:

- a. Request approval from this department for disposal of any wastes other than those originating from domestic septic tanks and chemical toilets.
- b. Notify all haulers in writing of those wastes allowed in the facility.
- c. Maintain an on-going record of each vehicle arriving at the site that documents the hauler's name; truck number (or license); and type, volume and source of waste.

I recommend we have a meeting in the near future to further clarify our department's position and to establish a schedule for submittals.

Sincerely,



L. N. Peterson  
Environmental Quality Division

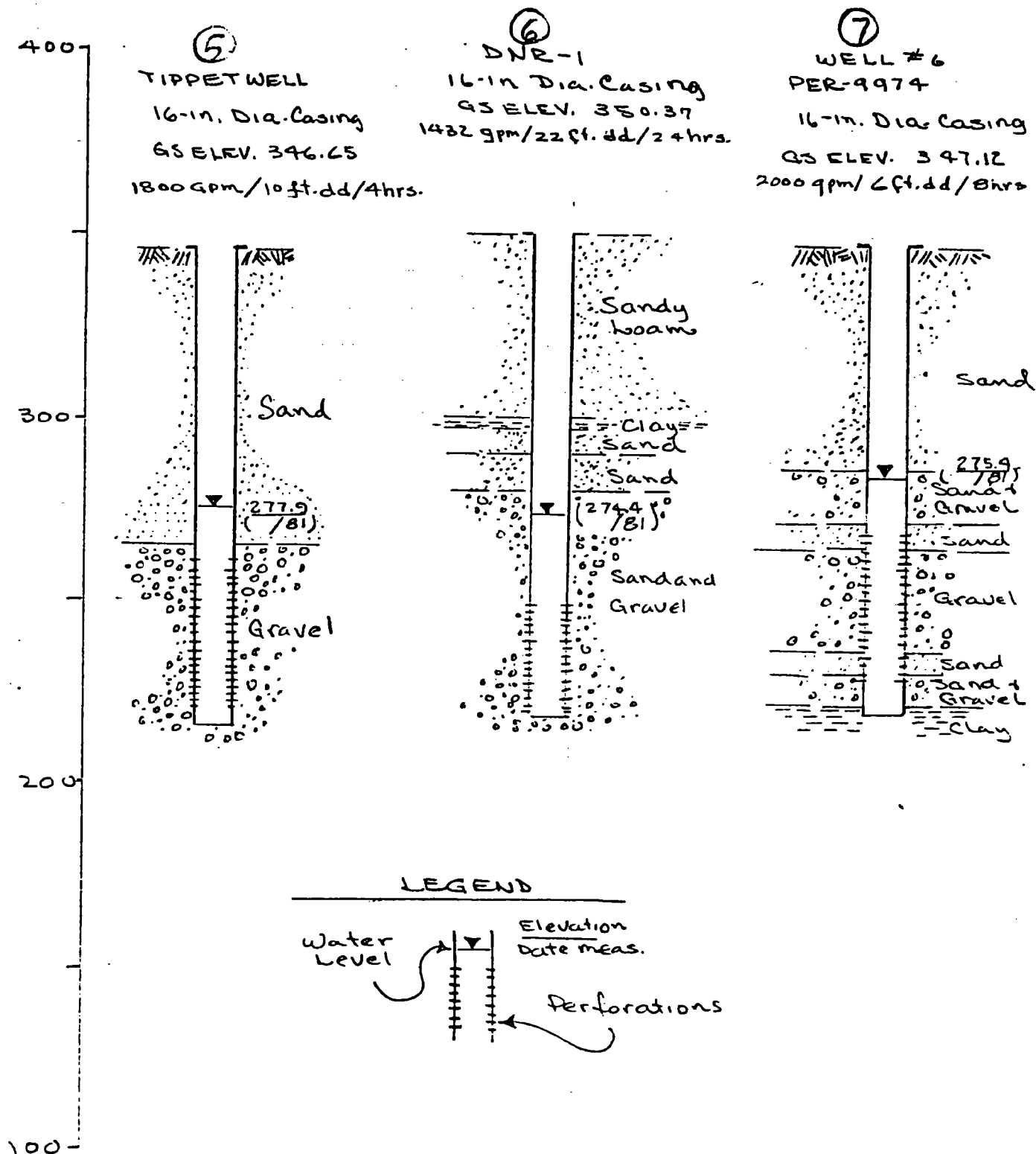
LNP:adh

APPENDIX 2

CALCULATIONS OF GROUNDWATER MOVEMENT



ELEVATION  
(feet, msl)



WELL C  
Q<sub>1</sub> = 333  
T<sub>1</sub> = 100  
Q<sub>2</sub> = 100  
T<sub>2</sub> = 100  
Q<sub>3</sub> = 100  
T<sub>3</sub> = 100

TRANSMISSIVITY				
FT <sup>3</sup> /FT/DAY (ft <sup>2</sup> /day)				
10 <sup>8</sup>	10 <sup>7</sup>	10 <sup>6</sup>	10 <sup>5</sup>	10 <sup>4</sup>
FT <sup>3</sup> /FT/MIN (ft <sup>2</sup> /min)				
10 <sup>4</sup>	10 <sup>3</sup>	10 <sup>2</sup>	10 <sup>1</sup>	10 <sup>0</sup>
GAL/FT/DAY (gal/ft/day)				
10 <sup>8</sup>	10 <sup>7</sup>	10 <sup>6</sup>	10 <sup>5</sup>	10 <sup>4</sup>
METERS <sup>3</sup> /METER/DAY (m <sup>2</sup> /day)				
10 <sup>8</sup>	10 <sup>7</sup>	10 <sup>6</sup>	10 <sup>5</sup>	10 <sup>4</sup>
SPECIFIC CAPACITY (gal/min/ft)				
10 <sup>8</sup>	10 <sup>7</sup>	10 <sup>6</sup>	10 <sup>5</sup>	10 <sup>4</sup>
WELL POTENTIAL				
Irrigation			Domestic	
UNLIKELY	VERY GOOD	GOOD	FAIR	POOR
			GOOD	FAIR
			POOR	INFEASIBLE

NOTES: Transmissivity (T) = KM where

K = Permeability

M = Saturated thickness of the aquifer

Specific capacity values based on pumping period of approximately 8-hours but are otherwise generalized.

FIGURE 2-4.—Comparison of transmissivity, specific capacity, and well potential. 103-D-1406.

PERMEABILITY

FT<sup>3</sup>/FT/DAY (ft<sup>2</sup>/day)



WELL NUMBER	$Q^{(1)}$ (gpm)	$DD^{(2)}$ (ft)	$Q/S^{(3)}$ (gpm/ft)	TRANS- MISSIVITY <sup>(4)</sup> (ft <sup>2</sup> /day)	SATURATED <sup>(5)</sup> THICKNESS (ft)	PERM. EABILI- TY <sup>(6)</sup> (ft/d)
TIPPET	1800	10	180	58,600	62	935
DNR-1	1432	22	65	27,000✓	56	482
WELL # 6 (PEE 9974)	2000	6	333	82,000	48	1708
AVERAGE						<u>1092</u>

TABLE 2-1.—Conversion factors for various units of hydraulic conductivity. 103-D-1454.

---Example (1)										
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
ft <sup>3</sup> /ft <sup>2</sup> /yr	ft <sup>3</sup> /ft <sup>2</sup> /day	ft <sup>3</sup> /ft <sup>2</sup> /hr	ft <sup>3</sup> /ft <sup>2</sup> /min	ft <sup>3</sup> /ft <sup>2</sup> /sec	in <sup>3</sup> /in <sup>2</sup> /day	in <sup>3</sup> /in <sup>2</sup> /hr	gal /ft <sup>2</sup> /day	m <sup>3</sup> /m <sup>2</sup> /day	cm <sup>3</sup> /cm <sup>2</sup> /hr	Darcy cm/s-cm (a1m/cm)
1	$2.74 \times 10^{-3}$	$1.141 \times 10^{-4}$	$1.903 \times 10^{-6}$	$3.171 \times 10^{-8}$	$3.287 \times 10^{-2}$	$1.37 \times 10^{-3}$	$2.049 \times 10^{-2}$	$8.35 \times 10^{-4}$	$3.479 \times 10^{-3}$	$1.133 \times 10^{-3}$
365	1	$4.167 \times 10^{-2}$	$6.945 \times 10^{-4}$	$1.157 \times 10^{-5}$	12	$5.0 \times 10^{-1}$	7.4805	$3.05 \times 10^{-1}$	1.270	$4.115 \times 10^{-1}$
8,760	24	1	$1.667 \times 10^{-2}$	$2.778 \times 10^{-4}$	288	12	179.5	7.32	30.48	9.872
525,600	1,440	60	1	$1.667 \times 10^{-2}$	17,280	720.0	10,772	438.9	1,829	591.7
31,536,000	86,400	3,600	60	1	1,036,800	43,200	646,315	26,335	109,723	35,549
30.42	$8.333 \times 10^{-2}$	$3.472 \times 10^{-3}$	$5.787 \times 10^{-5}$	$9.645 \times 10^{-7}$	1	$4.166 \times 10^{-2}$	$6.234 \times 10^{-1}$	$2.54 \times 10^{-2}$	$1.058 \times 10^{-1}$	$3.435 \times 10^{-2}$
730	2.0	$8.334 \times 10^{-2}$	$1.389 \times 10^{-3}$	$2.315 \times 10^{-5}$	24	1	14.96	$6.1 \times 10^{-1}$	2.540	$8.217 \times 10^{-1}$
48.78	$1.337 \times 10^{-1}$	$5.569 \times 10^{-3}$	$9.282 \times 10^{-5}$	$1.547 \times 10^{-6}$	1.604	$6.682 \times 10^{-2}$	-----	$4.07 \times 10^{-2}$	$1.697 \times 10^{-1}$	$5.494 \times 10^{-2}$
1,198	3.28	$1.368 \times 10^{-1}$	$2.27 \times 10^{-3}$	$3.78 \times 10^{-5}$	39.38	1.64	24.54	1	4.167	1.35
2874	$7.874 \times 10^{-1}$	$3.281 \times 10^{-2}$	$5.469 \times 10^{-4}$	$9.114 \times 10^{-6}$	9.449	$3.939 \times 10^{-1}$	5.890	0.24	1	$3.246 \times 10^{-1}$
886.96	2.43	$10.13 \times 10^{-2}$	$16.88 \times 10^{-4}$	$28.13 \times 10^{-6}$	29.20	1.217	18.2	$7.41 \times 10^{-1}$	3.08	1

All factors computed for 68°F with viscosity of 10050 centipoises

Examples

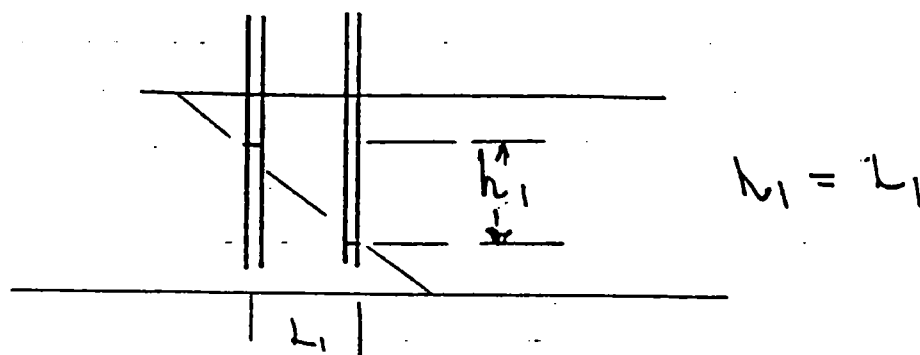
- (1) The permeability of a soil has been determined to be 15 gal/ft<sup>2</sup>/day. What is this in in<sup>3</sup>/in<sup>2</sup>/hr? Find value of 1 in Column ⑧ and move horizontally to value for in<sup>3</sup>/in<sup>2</sup>/hr in Column ⑦. Multiply value in Column ⑦ (0.0668) by 15 = 1.002 in<sup>3</sup>/in<sup>2</sup>/hr.
- (2) The permeability of a soil has been determined to be 4,000 ft<sup>3</sup>/ft<sup>2</sup>/yr. What is this in gal/ft<sup>2</sup>/day? Find value of 1 in Column ① and move horizontally to value for gal/ft<sup>2</sup>/day in Column ⑧. Multiply value in Column ⑧ (0.02049) by 4,000 = 82.0 gal/ft<sup>2</sup>/day.

Sources

- (1), (2), (5) From Driller's log data supplied by Kennawick office.
- (3) Calculated (5) Calculated by subtracting water level from aquifer depth
- (4) From Figure 2-4 (attached).



Since Hydraulic Conductivity (Permeability) values are calculated at the standard hydraulic gradient of 1 unit decline in head per 1 unit in length, measured parallel to the direction of flow:



then the average rate of flow through the media must be adjusted to match the average gradient or slope of the ground water surface under field conditions. This slope was reported to be approximately  $5' / 2500'$ .

Therefore, where Hydraulic Conductivity (or permeability) is  $\approx 1046$  ft/day (or  $\text{ft}^3/\text{ft}^2/\text{d}$ ) the adjusted average field rate is:

$$1,042 \text{ ft./day} \times \frac{4.9}{4900} \approx 1 \text{ ft./day}$$

NOTE: All data and calculations refer only to the gravel aquifer.

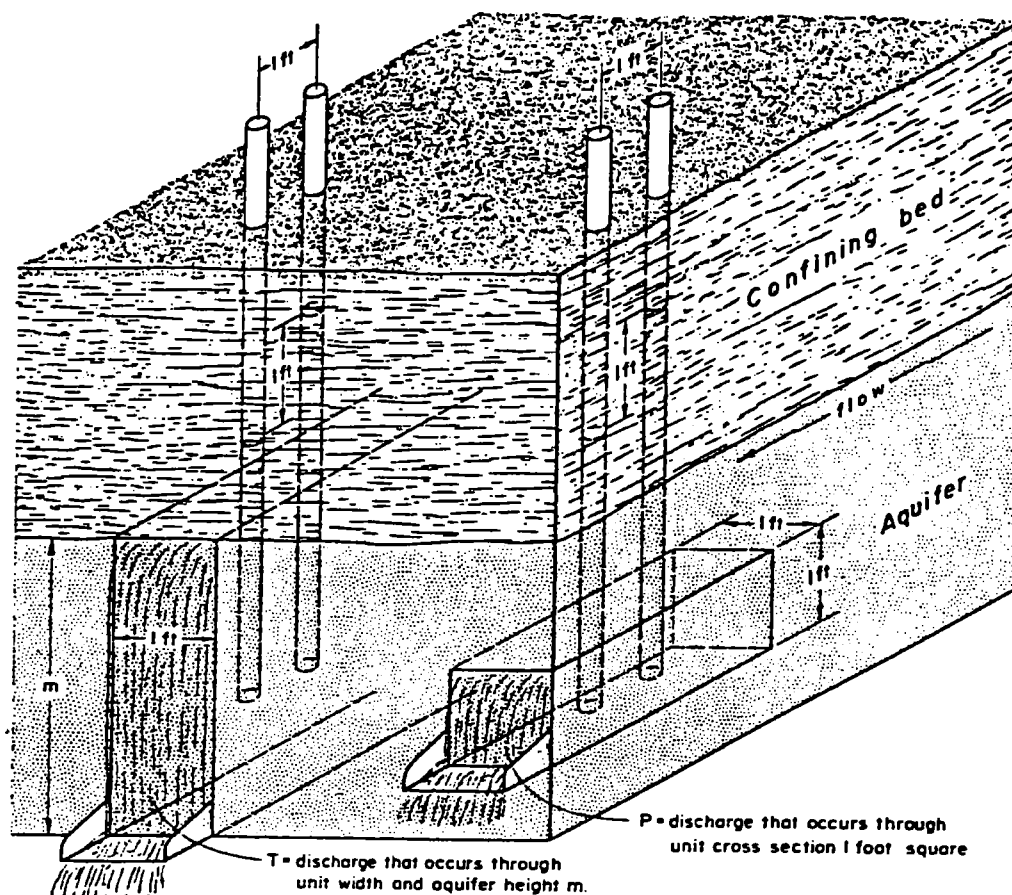


Figure 68. Graphical concepts of the coefficients of permeability and transmissibility. Coefficient of permeability multiplied by the aquifer thickness equals coefficient of transmissibility.

of the cone of depression. It is larger for cones of depression surrounding artesian wells than for those around water-table wells.

**Coefficient of storage,  $S$ ,** of an aquifer is the volume of water released from storage, or taken into storage, per unit of surface area of the aquifer per unit change in head. In water-table aquifers,  $S$  is the same as the specific yield of the material unwatered during pumping. In artesian aquifers,  $S$  is the result of two elastic effects—compression of the aquifer and expansion of the contained water—when the head or pressure is reduced during pumping. The coefficient of storage is a dimensionless term. Values for  $S$  for water-table aquifers range from 0.01 to 0.35; values for ar-

tesian aquifers range from 0.00001 to 0.001.

**Coefficient of transmissibility,  $T$ ,** of an aquifer is the rate at which water will flow through a vertical strip of the aquifer one foot wide and extending through the full saturated thickness, under a hydraulic gradient of 1.00 or 100 per cent.

Values of the coefficient of transmissibility range from less than 1,000 to over 1,000,000 gpd per ft. An aquifer whose transmissibility is less than 1,000 can supply only enough water for domestic wells and the like. Where the transmissibility is on the order of 10,000 or more, well yield can be adequate for industrial, municipal or irrigation purposes.